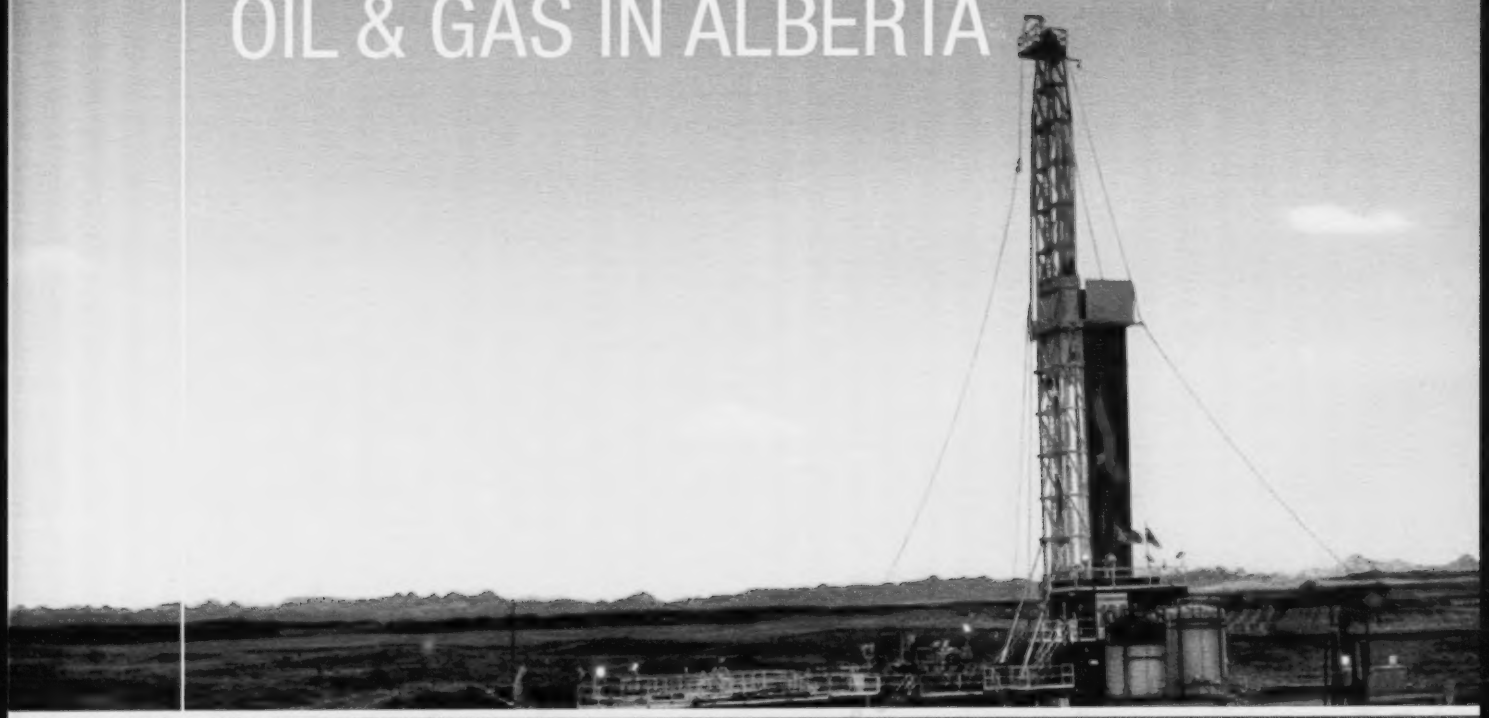
A Discussion Paper

REGULATING UNCONVENTIONAL OIL & GAS IN ALBERTA



ERCB Energy Resources Conservation Board

CONTENTS

1//EXECUTIVE SUMMARY 1

2//UNCONVENTIONAL RESOURCES IN ALBERTA 7
- 2.1//Background 7
- 2.2//Key Challenges of Unconventional Resource Development 8
  - 2.2.1//Management and Protection of Water 8
  - 2.2.2//Multistage Hydraulic Fracturing Technology Performance Assurance 8
  - 2.2.3//Regional Effects of Oil and Gas Activities on the Landscape 9

3//PRINCIPLES BEHIND THE UNCONVENTIONAL RESOURCE FRAMEWORK 9
- 3.1//Risk-Based Regulation 9
- 3.2//Play-Focused Regulation 9
  - 3.2.1//Definition of a Resource Play 9
  - 3.2.2//Why Regulate by Play? 10
  - 3.2.3//Regulatory Approach 11
  - 3.2.4//Regulatory Outcomes 11

4//THE UNCONVENTIONAL REGULATORY FRAMEWORK 11
- 4.1//Play-Focused Regulatory Processes 12
  - 4.1.1//Declaring a Play 12
  - 4.1.2//Play-Focused Requirements 12
  - 4.1.3//Planning and Collaboration 13
  - 4.1.4//Play Development Plans 13
  - 4.1.5//Project Plans 14
- 4.2//Pad Approvals 15
  - 4.2.1//Pad Requirements and Approval Process 15
  - 4.2.2//Pad Consultation and Notification 16
- 4.3//Compliance Assurance 16
- 4.4//Benefits and Challenges of Play-Focused Regulation 16
- 4.5//Other Considerations 18
- 4.6//Performance Monitoring 18
- 4.7//Implementation Strategy 18

APPENDICES

APPENDIX A: ACTIONS TO ACHIEVE REGULATORY OUTCOMES 19

APPENDIX B: DRAFT GUIDANCE ON REQUIRED ELEMENTS OF PLAY DEVELOPMENT PLANS 23

1//Water Management 23

2//Surface Infrastructure 25

3//Subsurface Reservoir Management 26

4//Stakeholder Engagement 27

5//Life-Cycle Wellbore Integrity 28

APPENDIX C: GLOSSARY 29

1//EXECUTIVE SUMMARY

Nearly a century of production has led to the steady decline of Alberta's conventional oil and natural gas reserves. Alberta is not unique in this respect: in jurisdictions throughout North America, industry has searched for and produced the most accessible energy resources and bypassed those beyond its technological and economic reach. In recent years, however, new technologies have emerged that allow companies to develop "unconventional" oil and gas resources that had been previously bypassed. Although unconventional resource development is still in its infancy in Alberta, advancements in technology will undoubtedly lead to increased development of the province's rich and largely untapped supply of unconventional oil and gas resources.

As Alberta's primary energy regulator, the Energy Resources Conservation Board (ERCB) is clear in its mission: to ensure that the discovery, development, and delivery of Alberta's energy resources take place in a manner that is fair, responsible, and in the public interest. In assessing the public interest, the ERCB has regard for public safety, environmental protection, and resource conservation.

This mission extends to all aspects of energy development, including unconventional resources. As interest in developing these resources increases, the ERCB is working to ensure that effective regulation is in place. This is nothing new; throughout its nearly 75-year history, the ERCB has proactively adapted its rules and processes in response to new issues and changes in the energy industry. Now the ERCB is again taking action to ensure its requirements progress by developing a new regulatory framework to govern unconventional oil and gas development.

The Case for Change

The ERCB's conventional regulatory framework is based on the development of oil and gas pools produced through vertical wellbores. These pools consist of "reservoir" rock that has good porosity to store oil and gas, good permeability to allow fluids to move easily through the rock, and a seal such as overlying shale to trap the oil and gas. Oil and gas migrate from "source" rock to this reservoir rock and become trapped in hydrocarbon pools. Conventional wells drilled into these pools typically drain oil and gas from large areas, often the equivalent of 100s of acres per well. Currently, applications for conventional development are required for each activity: drilling a well, building a pipeline, or building a processing facility. Wells are typically drilled from single-well pad sites.

Advancements in technology, such as horizontal wells and multi-stage hydraulic fracturing, have enabled the economic development of previously unattainable oil and gas resources. The use of this advanced technology creates new risks and opportunities. For example, unlike conventional hydrocarbon pools, unconventional resource development requires a greater scale of development and intensity of infrastructure (wells, roads, and other facilities) to be economical. This difference, and others, is driving the ERCB's work to introduce a new regulatory framework for the development of unconventional resources.

Alberta's regulatory framework needs to evolve to meet these new challenges, to provide all Albertans with assurance that the system effectively manages the risks associated with oil and gas development, to ensure efficiency in the regulatory system for industry, and to deliver the policy outcomes established by the Government of Alberta.

This discussion paper explores a new approach to regulating unconventional oil and gas resource development that is designed to meet these challenges.

Unconventional Resources

Unconventional resources include shale gas and oil, coalbed methane (CBM), and tight oil and gas. (Alberta's oil sands resources are also considered unconventional and are subject to strict ERCB regulations. Information on how the ERCB is working to improve the oil sands regulatory framework can be found at www.ercb.ca.) The chemical composition of unconventional oil and natural gas are essentially the same as their conventional counterparts; the term "unconventional" simply refers to how they are produced and the types of rock in which they are found.

A New Framework

Alberta's existing oil and gas regulations have served the province well. Not only do they help protect Albertans and safeguard the environment, they also make certain that our valuable energy resources are developed without waste. While the current regulatory framework for oil and gas development provides a solid foundation, the ERCB understands that it can build upon this base to address the unique issues, risks, opportunities, and challenges posed by unconventional resource development. As with all energy regulation, this new framework aims to

- clearly identify and mitigate potential risks to public safety, the environment, and the resource;
- ensure orderly development; and
- avoid imposing unnecessary regulatory burden on industry.

Risk-Based and Play-Focused

The new framework recognizes the distinct challenges associated with developing unconventional resources. For example, unconventional developments typically extend over broad areas and require a greater concentration of infrastructure to make production economically viable. Other challenges relate to protecting water, issues around high-pressure hydraulic fracturing, and the regional effects such activities can have on the landscape.

To meet these challenges, the ERCB's new framework is based on two basic principles:

1. **Risk-based regulation**—regulatory responses that are proportional to the level of risk posed by energy development.
2. **Play-focused regulation**—regulatory solutions that are tailored to an entire "play" to achieve specific environmental, economic, and social outcomes.

A "play" is an area of oil and gas development that is determined mainly by geology, geographic area, the properties of the resource, and the technology required to develop that resource. Surface impacts are also considered where different land uses may be affected to a greater or lesser degree by unconventional development. The play concept differs from the current regulatory model where development generally occurs on a well-by-well basis. Under the new framework, the ERCB will formally declare plays based on their unique qualities and the level of risk that development of the play could pose.

While the requirements in the ERCB's existing framework will serve as baseline regulatory

requirements that must be followed, these requirements may be modified or superseded by play-focused requirements where appropriate. The ERCB will clearly identify changes to, or deviations from, baseline requirements for each declared play.

Play Development Plans

To manage the effects of development and other issues of a regional nature, a play development plan will use a performance-based regulatory approach, rather than prescribing how regulatory outcomes must be achieved. The ERCB will encourage multioperator play development plans, in which a group of operators can show how play-specific outcomes are achieved. These plans will offer operators flexibility in how the regulatory outcomes are achieved. The ERCB believes collaboration on play development plans is the most effective way to achieve regulatory outcomes and strongly encourages companies to consider play-focused operator groups early in the development process. Collaboration will allow optimization of infrastructure needs and placement, sharing of information and knowledge, and a one-window approach for communication with stakeholders.

Play development plans must include enough detail to show how the following key challenges will be addressed:

- **Water management:** protecting and efficiently using Alberta's water resources.
- **Surface infrastructure development:** minimizing surface infrastructure development and associated impacts such as footprint, linear disturbances, vehicle traffic, dust, emissions, odors, and noise.
- **Subsurface reservoir management:** maximizing short- and long-term resource recovery, including early identification of enhanced recovery opportunities.
- **Stakeholder engagement:** involving the local community and other stakeholders throughout the full life cycle of the project, from early in the play development through to abandonment, to determine which issues are of particular concern and how they might be addressed.
- **Life-cycle wellbore integrity:** ensuring wells are drilled, completed, stimulated, produced, suspended, and abandoned in a manner that assures wellbore integrity, considering the risks imposed by the unique reservoir characteristics of the play and the technologies being employed.

The ERCB understands that play development plans will not always be possible early in the process. Since each operator may undertake development at a different pace, have different capital budgets, and use different approaches, reaching consensus on every aspect of development may be difficult. As a precursor to collaborative planning from all active operators, the ERCB will require operators to submit a project plan for their own lease holdings; companies with adjoining leases will be encouraged to submit joint project plans.

These project plans must provide enough detail on the five key challenges outlined above—water management, surface infrastructure development, subsurface reservoir management, stakeholder engagement, and life-cycle wellbore integrity—to demonstrate how these issues will be adequately and effectively managed.

To respond to these five key challenges and others that could arise in the future, the ERCB has established critical outcomes that reflect its regulatory mandate and take into account the nature of unconventional resource development. These outcomes include:

- Water management
  - Maintain a sustainable level of nonsaline water use.
  - Maintain the quality of surface water and nonsaline groundwater.
- Waste management
  - Conserve resources, minimize waste, prevent pollution, and protect the environment and the public.
- Air quality
  - Ensure that the public and the environment are not measurably affected by adverse air quality.
- Conservation
  - Maximize economic recovery of reservoir fluids and conservation of gas.
  - Ensure equal opportunity for all resource owners in receiving an equitable share of production.
- Orderly development
  - Minimize issues of a regional nature and cumulative effects of oil and gas development.
- Public safety
  - Ensure that oil and gas activities do not compromise public safety.
- Information and advice
  - Understand and disseminate information on the extent of resources in the play, production capacity, reserves volumes, and other geological and reservoir characteristics.

Pad Approvals

The use of multiwell pads is a central element in unconventional resource development. Multiwell pads—where multiple horizontal wells are drilled from a single site instead of from numerous locations—reduce the surface footprint of infrastructure and, therefore, the environmental impacts of development.

The ERCB will introduce a new pad approval process to facilitate placing multiple wells and their associated facilities on one pad. The new process will combine approval for activities such as drilling and completing multiple wells and installing related production equipment on a pad into one approval. Pad approvals could be used anywhere in the province.

Early and Meaningful Engagement

Play-focused regulation will enhance engagement by ensuring early disclosure of development plans. Not only will the ERCB require operators to develop and implement effective community-engagement processes, but stakeholders will have the opportunity to give feedback on play development plans. The ERCB will consider all feedback in its decision to approve the plan.

Furthermore, the ERCB will establish performance indicators and measures to monitor and evaluate whether regulatory outcomes are being achieved. This performance information will be made available to the public, making the ERCB and play operators accountable for achieving the established outcomes.

Compliance and Outcome Assurance

As is the case with any oil and gas activity carried out in Alberta, compliance assurance has a critical role in the play-focused regulatory system in ensuring that development occurs in a manner that protects public safety, minimizes environmental impact, provides for effective conservation of

resources, and maintains stakeholder confidence in the regulatory process.

The ultimate goal of the program is to ensure compliance by monitoring and enforcing the ERCB's requirements on behalf of all Albertans.

The Next Step

The ERCB is seeking public and stakeholder feedback on the development of unconventional oil and gas regulation. All feedback will be considered as the ERCB moves forward with this new regulatory approach.

Once finalized, the new regulatory framework will be tested on one or two key resource plays before being applied elsewhere in Alberta. A team of experts from the ERCB will monitor the performance of these first declared plays, allowing them to identify any necessary changes and implement them quickly.

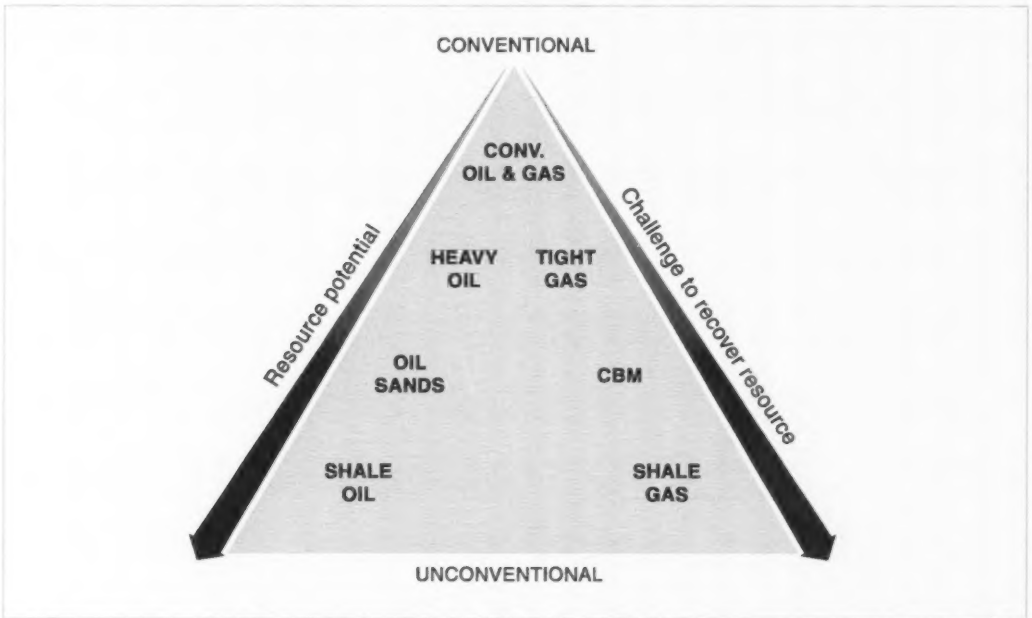
2//UNCONVENTIONAL RESOURCES IN ALBERTA

2.1//Background

Conventional oil and gas development is characterized by vertical wells with good recovery factors and large drainage areas. However, the productivity of conventional oil and gas wells has declined significantly in recent years. The development of unconventional oil and gas, however, is associated with advanced technologies, such as long-reach horizontal wellbores and hydraulic fracturing, and unique operating strategies based on different reservoir characteristics, engineering challenges, and data needs. Small drainage areas and low recovery factors require higher subsurface drilling densities. Unconventional resource deposits cover broader areas than conventional oil and gas pools due to the geological conditions at the time of deposition, which favoured deposits of shales and other very fine grained rocks. Consequently, unconventional resources are not difficult to discover relative to conventional oil and gas pools; the challenge lies more in the technical and economic extraction of the resource.

Unconventional resources are a key part of the future of Alberta's energy resource sector as Alberta has significant unconventional resource potential. Just how large the resource potential could be is the focus of current studies at the ERCB. The term unconventional describes a shift on the resource continuum to resources of larger potential and with increased technical challenges to recover (see Figure 1). The term unconventional has typically been applied to oil- or gas-bearing zones with low to very poor permeability that require increased reservoir access and/or extensive stimulation to produce in commercial quantities. Advanced completion technologies are required

FIGURE 1. RESOURCE PYRAMID



to artificially create permeability in the rock—currently best achieved with hydraulic fracturing. Such reservoirs do not fit the classic description of pools used to define conventional oil and gas.

2.2// Key Challenges of Unconventional Resource Development

The ERCB's regulatory framework must continue to recognize and respond to the risks oil and gas development poses to conservation, public safety, and the environment and ensure orderly development without introducing undue regulatory burden on industry. It must also respond to those characteristics of unconventional resources that create new regulatory challenges, such as subsurface areal extent and technologies used to extract the oil or gas. With these in mind, the ERCB has identified the key challenges of unconventional oil and gas development to be

- management and protection of water,
- performance assurance of multistage hydraulic fracturing technology, and
- regional effects of activities on the landscape.

2.2.1// Management and Protection of Water

Development of some unconventional resources, specifically shale formations, will require access to large volumes of water for hydraulic fracturing. Water sourcing, transportation, recycling, storage, and disposal must be managed effectively to mitigate risks to surface water and nonsaline groundwater.

The ERCB has a mandate to ensure that oilfield operations do not affect the quality of nonsaline water. Alberta Environment and Sustainable Resource Development (ESRD) has a mandate to establish policies related to the protection and sustainable use of all water by all industry and the public. The two agencies work together to ensure the protection and proper management of Alberta's water resources in the face of oil and gas activities.

2.2.2// Multistage Hydraulic Fracturing Technology Performance Assurance

Technology innovation, including the combination of multistage hydraulic fracturing and horizontal well technology, is considered by many to be fundamental to the future success of unconventional resource development. To ensure that new innovations do not adversely affect its long-standing public interest outcomes of conservation, equity, safety, and environmental protection, the ERCB is actively monitoring the application and overall performance of the technology in various unconventional plays being pursued in Alberta. While the ERCB is confident that compliance with current regulatory requirements results in safe operations throughout the life cycle of a well (i.e., drilling, completion and stimulation, production, and abandonment), it recognizes the importance of timely assessment and review of hydraulic fracturing issues. For unconventional wells stimulated with hydraulic fracturing, these issues include

- potential crossflow of fluids from one subsurface geological formation to another,
- wellbore completion design and operations to prevent unintended pressure communication to offset energy wells penetrating the same geological formation,
- chemical use during hydraulic fracturing operations,
- fluids and waste management, and
- prolonged venting and flaring.

Some of these matters may require additional research and field work.

2.2.3//Regional Effects of Oil and Gas Activities on the Landscape

Due to the continuous nature of unconventional resource deposits, development may occur over large areas, possibly many townships in size. While long-reach horizontal drilling allows multiple wells to be drilled from a single surface location, most unconventional resource development requires a level of infrastructure and activity that may increase effects on water, air, and land as well as conflicts with other surface land uses. Increases in vehicle traffic, noise, dust, emissions, and light pollution are common and must be effectively managed in an improved regulatory approach to reduce overall impact.

3//PRINCIPLES BEHIND THE UNCONVENTIONAL RESOURCE FRAMEWORK

While the ERCB continues to apply the current regulatory system, it will update Alberta's regulatory framework to address unconventional resource development and industry's use of new technologies to extract these resources.

This new framework will continue to support the ERCB's regulatory mandate to make sure Alberta's resources are conserved and properly appraised and that safe and efficient operating practices are followed. Furthermore, it will protect the public interest by ensuring economic, orderly, and efficient development, while making certain that each company receives its fair share of production.

Finally, the framework will ensure that relevant information is collected and shared in a timely fashion, that Government of Alberta efforts to control pollution are supported, and that social, economic, and environmental impacts are taken into account.

The new unconventional oil and gas framework is based on two principles: risk-based and play-focused regulation.

3.1//Risk-Based Regulation

Risk-based regulation can mean different things to different stakeholders. For clarity, the ERCB has defined risk-based regulation as a decision-making framework used to ensure that a regulatory response is applied at a level that is proportional to the severity of the risk.

The ERCB has historically addressed risk inherent in the development of Alberta's energy resources by analyzing the risk and instituting appropriate measures to mitigate it. The new framework builds on that foundation by providing a formal, consistent approach that can be uniformly applied.

3.2//Play-Focused Regulation

3.2.1//Definition of a Resource Play

A play represents a three-dimensional entity that is the target of oil or gas development. It has a number of characteristics that can be used to describe it, including the specific geological formation, areal extent, geographic location, types of fluids in the rock, and other geological and reservoir characteristics.

There are many different categories of plays. A resource play is one such category. A resource play is a set of known or estimated oil or gas accumulations with similar geologic, geographic, and temporal properties, such as the source rock, migration pathway, trapping mechanism, and hydrocarbon type. In conventional oil and gas, hydrocarbons are expelled from a source rock and, given their buoyancy, migrate through reservoir rock until they become trapped. Most unconventional resource development targets the

source rock itself, which can cover very large areas in the subsurface. This is an important difference between conventional hydrocarbon pools and unconventional resource plays and must be considered when implementing play-focused regulation.

A play-focused regulatory framework is aimed at a resource play level, with the geographic limit of each resource play constrained within the limits of a specific geologic formation that defines the play. As a result, there will often be situations where plays are vertically stacked on top of each other, where more than one geological formation is productive in the same geographic area.

3.2.2//Why Regulate by Play?

Play-focused regulation will enable the ERCB to develop regulatory responses that address specific areas of concern in a play. To do this, each play would be defined by characteristics that determine the level or type of risk that development of the play might generate. These characteristics include the geology, geographic area and corresponding land use, technology being employed, fluids produced, and other reservoir properties. By examining these characteristics, a risk profile can be determined for a specific play. Various strategies can then be employed to achieve a regulatory response that is proportional to the risk being managed and reduce risks to acceptable levels. The ERCB will be proactive in assessing potential unconventional resource plays and monitoring early indicators of activity to better anticipate emerging development of a play. This will include early work to assess risks, establish outcomes, determine performance indicators, and develop strategies to mitigate risk for the play.

Certain aspects of unconventional resource plays also make it critical to consider provincial and regional policies that affect oil and gas development in Alberta, such as *Water for Life* and the *Land-use Framework*. Play-focused regulation is an opportunity to effectively deliver the regulatory policies and goals set out in these documents and regulate regional effects of unconventional resource development to achieve regulatory outcomes.

Play-focused regulation will be delivered through various regulatory mechanisms that together will ensure that development within a resource play achieves the desired outcomes in every stage of development: from early exploration to full scale commercial. These will include play-specific requirements, planning and collaboration, authorizations, and compliance assurance. The ERCB's existing regulatory requirements and processes will remain in effect unless modified for a specific play.

An important aspect of play-focused regulation will be planning, as unconventional resource plays, although geologically known, can be technologically challenging. However, this geological certainty opens up opportunities to plan an approach to development and overcome technological challenges through enhanced industry collaboration, stakeholder involvement, and adaptive regulatory processes. Effective planning and implementation can reduce the amount of infrastructure needed and make it more efficient. It can also improve assessment and management of the effects of development and improve regulatory processes.

3.2.3//Regulatory Approach

The ERCB's regulatory approach will consider the full spectrum of approaches and employ the most appropriate considering the nature of the risk, development maturity, and other factors. The regulatory approaches used could range from highly prescriptive regulatory requirements that dictate how an activity must be conducted to performance-based regulations that set the regulatory outcomes to be achieved and allow the regulated entity to determine how best to achieve them. Some aspects of new emerging resource development can benefit from a performance-based approach, which provides flexibility and encourages technological advancement and innovation.

The ERCB's regulatory approach will also consider industry's success in developing industry recommended practices (IRPs) to manage the effects of unconventional resource development, such as the *Guiding Principles for Hydraulic Fracturing* published by the Canadian Association of Petroleum Producers (CAPP). If the ERCB is satisfied that industry-developed IRPs can be successful in achieving outcomes, commitment to those IRPs by operators within a play can form a part of the overall regulatory process for that play. The ERCB's role would evolve from up-front authorization to monitoring to ensure that compliance with IRPs is achieved and, therefore, that the regulatory outcomes are met.

3.2.4//Regulatory Outcomes

To respond to the challenges described in Section 2.2 and those that could develop in the future, the ERCB, considering its regulatory mandate and the characteristics of unconventional resource plays, has established the following regulatory outcomes for unconventional resource plays:

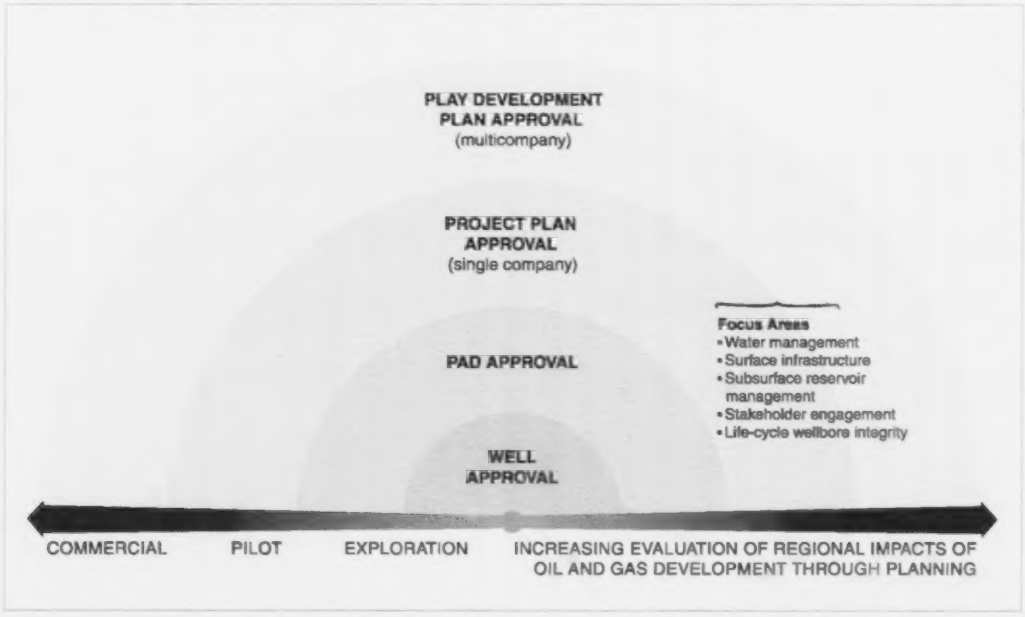
- Water management
  - Maintain a sustainable level of nonsaline water use.
  - Maintain quality of surface water and nonsaline groundwater.
- Waste management
  - Conserve resources, minimize waste, prevent pollution, and protect the environment and the public.
- Air quality
  - Ensure that the public and the environment are not measurably affected by adverse air quality.
- Conservation
  - Maximize economic recovery of reservoir fluids and conservation of gas.
  - Ensure equal opportunity for all resource owners in receiving an equitable share of production.
- Orderly development
  - Minimize issues of a regional nature and cumulative effects of oil and gas development.
- Public safety
  - Ensure that oil and gas activities do not compromise public safety.
- Information and advice
  - Understand and disseminate information on the extent of resources in the play, production capacity, reserves volumes, and other geological and reservoir characteristics.

These regulatory outcomes and some example play-focused actions that could be used to achieve them are described in more detail in Appendix A.

4//THE UNCONVENTIONAL REGULATORY FRAMEWORK

To achieve the regulatory outcomes, a new regulatory framework for unconventional resource

FIGURE 2. UNCONVENTIONAL RESOURCE FRAMEWORK



development will recognize and address issues of a more regional nature across a play (see Figure 2). As development increases from initial exploratory wells to full scale commercial development, regional impacts will be addressed through increased emphasis on planning and collaboration among operators in a play. This will be achieved by requiring play development plans or project plans that address water management, surface infrastructure, subsurface reservoir management, stakeholder engagement, and life-cycle wellbore integrity. As multiwell pads are an important element of managing the surface footprint of unconventional resource plays, the ERCB will also introduce a new pad authorization to facilitate this.

4.1// Play-Focused Regulatory Processes

4.1.1// Declaring a Play

The ERCB will formally declare a resource play based on resource potential and development activity, which includes an evaluation of its characteristics, the risks posed by development, and its stage of development. A declared play would indicate the geological formation, or formations, and geographic area.

Once a play is declared, the ERCB will identify expected outcomes, modifications to existing ERCB requirements, and new requirements and/or regulatory processes for that play in a Board Order. As a baseline, operators within a play must follow all current regulatory requirements except where modified or superseded by play-focused requirements in the Board Order. Changes or deviations from existing requirements will be clearly identified for each declared play. As development within a play proceeds and matures, the ERCB may adjust the declared play boundary and specific requirements or processes as necessary.

4.1.2// Play-Focused Requirements

As for all upstream oil and gas operations in Alberta, existing ERCB requirements will provide

the foundation for operations within a declared play. These will be modified specifically for that declared play and its phase of development.

Modified requirements will be common across the play and clearly set out in the Board Order declaring the play. Depending on the characteristics of the resource play and the associated risks or issues to be managed, modified requirements could include a new or enhanced requirement or a relaxation of a standard requirement. Some examples of current ERCB regulation that could be subject to play-focused rules are subsurface reservoir development, production controls, flaring limits, geohazard assessment, technology-specific design or operation, and data requirements and reporting.

4.1.3//Planning and Collaboration

The ERCB intends to apply performance-based regulation to unconventional resource development and establish regulatory outcomes where appropriate. Industry will be expected to meet or exceed these expectations through collaboration with other operators in the play and with the communities affected by development. The ERCB believes that this is the best, most efficient way of ensuring that these regulatory outcomes are reached. Increased emphasis on planning and collaboration among operators and other stakeholders within a play will be critical given the nature of unconventional resources—their large continuous extent, potential regional effects, the technology and infrastructure needed to exploit them, and the need to maximize economic efficiency. The ERCB will strongly encourage all operators within a declared play to establish a play-focused operators' group early in the development of a play to work on the play development plan.

4.1.4//Play Development Plans

A play development plan is intended as a tool to manage the effects of development and issues of a regional nature. The ERCB will expect operators in a play to produce a play development plan at an appropriate stage in the life of a play. Play development plans should be developed early so as to be the most effective and to address the full lifecycle of a play's development. At a minimum, they should be designed to achieve the regulatory outcomes in Section 3.2.4 and any others established for the specific play. All operators in a play should collaborate on the plan and implement an effective method of obtaining input from stakeholders during its development. Development plans should be reviewed and updated on a regular basis as a play develops and circumstances change.

Play development plans must address the following five issues and demonstrate how the operators will achieve the regulatory outcomes for unconventional resource plays:

1. Water management practices that protect and efficiently use Alberta's water resources
2. Surface infrastructure development that minimizes associated impacts such as footprint, linear disturbances, vehicle traffic, dust, emissions, odors, and noise
3. Subsurface reservoir management practices that maximize short- and long-term resource recovery, including ways to identify early opportunities for enhanced recovery
4. Stakeholder engagement that proactively involves the local community and other stakeholders throughout the full life cycle of the project, from early in the play development through to abandonment, to determine which issues are of particular concern and how they may be addressed

5. Life-cycle wellbore integrity management that ensures fluid containment within the wellbore and well control through the full life cycle of the well, from drilling to abandonment

A detailed explanation of these issues, their desired outcomes, and a draft of potential content that may be required for play development plans is provided as guidance in Appendix B. The level of detail with respect to scale and scope will depend on the stage of play development—exploratory, piloting, or full commercial—and the characteristics of the play. A play development plan offers industry flexibility in how it chooses to meet the regulatory outcomes for the play, which can include incorporation of industry recommended practices.

When complete, a play development plan would be submitted to the ERCB for review. The ERCB may request additional public input on the play development plan and consider the input in its decision on the plan. The ERCB will approve plans that are complete and satisfactorily address the five issues stated on Page 13.

While the ERCB acknowledges that collaboration among all operators in a play may not be feasible during early stages of development, a play development plan is expected as the play moves into full commercial development. Early collaboration is strongly encouraged so that stakeholder concerns are understood and can be addressed. Within a play development plan, operators should have well-developed processes that effectively engage stakeholders and build relationships with the community. Where the plan is not being implemented effectively, other ERCB processes will continue to be in place to ensure that those affected by development have an opportunity to be heard.

Industry operators responsible for developing the plan will need to meet with the ERCB on a regular basis to review their performance in achieving stated outcomes and make any necessary modifications. Industry's performance on achieving regulatory outcomes will be monitored and communicated to all stakeholders.

The ERCB recognizes that these play development plans are a significant change and that the transition will take time. Operators are encouraged to move quickly to developing and using these plans. If play development plans are not in place, project plans—as described below—will be required.

4.1.5//Project Plans

Although the preferred approach to resource play development is collaboration, complications may arise if operators in a play are undertaking development at different paces, with different capital budgets, and with different approaches. Until a play development plan can be put in place, the ERCB will require operators to submit project plans for their respective lease holdings.

A project plan allows for a proactive planned approach to a portion of a play leased by an operator. It will increase understanding and transparency of resource development in the area and provide a mechanism to address, at a reduced scale, the same five regional issues required to be addressed in the play development plan. It will identify challenges and opportunities early, effectively engage stakeholders, and rationalize required infrastructure. It also opens up opportunities to streamline and improve data requirements, reduces redundant regulatory process by bundling and reducing the number of approvals, and allows more regulatory flexibility as new technology develops.

Where practical, companies with adjoining leases will be encouraged to submit joint or complementary project plans. The ERCB may specify that a project area be of a minimum size or that adjacent projects be consolidated to avoid "piecemeal" development that might prevent a proper understanding of overall effects and frustrate rationalization with other projects developing in the play.

The level and detail of information required in a project plan would depend on the phase of development and be scoped accordingly. The ERCB will develop guidance on specific project plan requirements based on the draft guidance for play development plans in Appendix B to provide a level of certainty to those operators requiring specific direction on the contents of the project plan.

Project plans will undergo review by the ERCB. This review will include an opportunity for input from stakeholders. The ERCB will consider this input and make any required changes to the plan or approval conditions. The ERCB would have the option of initiating a public hearing on a project plan if the stage, scale, and impacts warrant it. Opportunities for stakeholder input would be enhanced through early engagement, and potentially affected parties would retain all their existing options as defined in the ERCB legislation.

Approved project plans will set out key parameters for the project but would not necessarily specify exact details such as the locations of well pads or pipeline routes. This allows an operator more flexibility in how it conducts operations once the ERCB has approved it. Any amendments to a project plan will require the ERCB's approval. ERCB staff will review performance and achievement of the project plan's regulatory outcomes with the operator on a regular basis.

4.2// Pad Approvals

To facilitate placing multiple horizontal wells on a single pad location, a new pad approval process will be introduced. Compared to multiple conventional vertical well sites, pad development reduces effects on the environment and land use by consolidating and reducing the overall surface footprint—reducing the number of pipelines and access roads to a pad site for example.

Pad approvals will also streamline and improve the efficiency of the application and approval process for repeat activities that occur on one location and will support early multiwell production operations. These approvals will enable multiple activities, such as drilling and completing multiple wells and the surface equipment required to support multiwell production, to be bundled into one approval. In the case of a stacked play, pads may service more than one producing horizon. Once a pad is licensed, wells can be drilled and production equipment can be installed. Details would then be registered with the ERCB within a certain time period. During postexploration, developments with multiple single-well pads would be discouraged as they are less likely to achieve regulatory outcomes.

Pad approvals can be included as part of a play development or project plan. They may also be used as a standalone process outside a declared play.

4.2.1// Pad Requirements and Approval Process

The operator would submit details and documents to support the proposed pad location and the drilling, completion, and production phases in an application to the ERCB. The pad could then be

approved if there were no objections and it were deemed complete and reflected good planning practices. Pad approvals would allow multiple activities to occur over an extended period. The ERCB is currently considering pad approvals that would allow drilling up to three years from the approval date. Additional postapproval notifications and data submissions, in some instances, would be pad based instead of well based.

4.2.2//Pad Consultation and Notification

Currently, ERCB approvals are required for every activity (e.g., for each well on a multiwell pad). However, consultation and notification distances for landowners or residents do not reflect concentrated pad activities or extended periods of activity on the pad site. Under the new pad approval process, expanded landowner and resident notification would be required to ensure awareness of proposed activities, that concerns are heard, that pad sites are properly located, and that mitigative measures are applied. The ERCB will expect meaningful consultation designed to address landowner and resident concerns.

The current process for dispute resolution and hearings to address valid objections that remain unresolved would continue to apply to pad approvals.

In addition to site-specific pad notification requirements, play and project plans must address stakeholder engagement at the community level.

4.3// Compliance Assurance

Compliance assurance will be critical in supporting play-focused regulations, and it is expected that a range of compliance assurance processes will be used. Ultimately, compliance assurance processes must demonstrate that regulatory outcomes are achieved. Operations that may affect public safety or the environment will be subject to the most stringent processes, including ERCB field inspection and enforcement. With increased emphasis on planning, regular evaluations of a plan's effectiveness and the development's performance relative to the desired regulatory outcomes may be introduced.

Increased flexibility offered by a play development or project plan may also require the ERCB to increase audits. Operators or groups of operators within a play may develop internal or third-party compliance assurance mechanisms that could have a role in an overall compliance assurance model for a play.

4.4// Benefits and Challenges of Play-Focused Regulation

The activity-by-activity review and approval processes of the ERCB's present regulatory framework were not developed to manage the potential regional effects of unconventional resource development. By providing guidance and criteria on how a play area can be developed, play-focused regulation considers the features of the area being developed and works to reduce the regional impact of oil and gas activities. Regional solutions will reduce the effects of oil and gas development on the landscape, more efficiently resolve potential conflicts, and provide greater certainty on how to appropriately develop unconventional resources. Parties will be able to consider issues and develop solutions earlier in the development process, instead of repeatedly dealing with issues one application at a time.

The benefits and challenges of a play-focused regulatory approach are summarized in Table 1.

TABLE 1. BENEFITS AND CHALLENGES OF PLAY-FOCUSED REGULATIONS

Benefits	• **Improved community acceptance:** Proactive industry planning and consultation with the community can lead to a better understanding of the project and improved opportunities to incorporate broader community and other stakeholder needs into a development. • **Collaborative planning:** Cooperation and collaboration between industry partners and other affected stakeholders in project and play-based planning hold opportunities to share knowledge and resources to the benefit of all. • **Improved regulatory efficiency:** - Play-based plans could reduce duplications in regulatory process and provide opportunities to share costs of monitoring, study, and analysis. - Pad-based applications will replace having to submit multiple individual applications. This will provide a time frame for development, save administrative burden, improve emergency response planning, and reduce duplications in notification and consultation. - Opportunities to reduce or eliminate requirements where risks are low and implement less prescriptive options and streamlined processes. • **Data requirements align with type and stage of development and regulatory need:** As knowledge and understanding of a play change over time, so should data requirements. At the pilot stage, industry may collect more data than is required by regulation to fully understand how best to exploit the reservoir. At a full commercial development stage, the reservoir may be well understood and the ERCB may relax some data requirements. • **More risk mitigation options:** The new regulatory framework will consider a broad scope of options for mitigating risk, from more traditional, prescriptive requirements to performance-based requirements, management systems, and industry best practices. • **Outcomes-focused approach that supports and encourages technical innovation.** • **Supports effective engagement:** Effective engagement results in better information and stakeholder satisfaction by - assuring early integration of local knowledge, - sharing conceptual full scale development plans with affected communities, - being proactive and allowing for input on development planning at the play level, and - providing opportunity for participation outside of an adjudication process. • **Managing of regional effects:** Regional effects of play development can be managed. • **Better information to support planning:** Play development planning will help achieve the objectives of government regional planning initiatives, such as *Water for Life* and the *Land-use Framework*, and assist municipal infrastructure planning.
Challenges	• **Requirements for advance planning:** Industry must allocate effort and resources for greater advance planning. • **Information disclosure:** Expectation that information on full-cycle resource development plans will be disclosed may conflict with the need to keep sensitive, competitive information confidential. • **Requirements for increased stakeholder participation:** Stakeholder participation in play planning processes can be time consuming with limited, or no, compensation for related expenses and time. Good facilitation is important. • **Regulatory approach:** Shift in method and process of regulation.

4.5// Other Considerations

The ERCB has also identified evolving challenges at an operational level that it will assess and change where risks warrant or where streamlining processes can improve efficiency. Some of these challenges include

- improving the understanding of how geology, completion type, and pressures used influence the 3D hydraulic fracture propagation envelope;
- understanding appropriate spacing of horizontal wells and corresponding fracture patterns to ensure optimal resource production and minimize well operational problems;
- improving an understanding of the effects of hydraulic fracturing, especially with respect to interformational crossflow and minimizing unintended pathways to offset energy wells penetrating the same formation;
- improving wellbore integrity assurance;
- improving regulatory response to new technologies, including risk assessment and approval mechanisms;
- improving clarity on how a producing well is classified as an oil or gas well and the effects of the classification on horizontal wells in shales or other resource plays;
- improving an understanding of regulatory data needs for unconventional resources; and
- clarifying pool designation process for resource plays.

The ERCB will continue to assess these types of issues as they arise and develop an appropriate response to the level of assessed risk.

4.6// Performance Monitoring

The ERCB will develop a performance monitoring process to assess the achievement of regulatory outcomes. Performance indicators, targets, and thresholds will support understanding and the ability to respond to the actual and potential effects of energy development. Monitoring performance indicators will allow the ERCB to

- determine whether play development and project plans and any other related processes are effective in meeting regulatory outcomes,
- determine the effectiveness of regulatory tools and processes,
- identify where opportunities exist for improvement,
- proactively identify new risks or thresholds being approached or exceeded, and
- consult key stakeholders as performance monitoring processes are developed.

4.7// Implementation Strategy

The new framework will continue to evolve based on feedback from stakeholders over the next few months. The ERCB intends to meet with key stakeholders and representatives from appropriate government departments to discuss this approach and determine best practices.

Initially, the ERCB will implement the new framework by focusing on one or two key resource plays, such as the Duvernay Formation, to further develop and test concepts before applying them universally. The ERCB will assign an internal multidisciplinary team to the first of the declared plays to monitor the new regulatory framework. This will allow necessary changes to be recognized and implemented quickly.

APPENDIX A: ACTIONS TO ACHIEVE REGULATORY OUTCOMES

ERCB MANDATE/ CATEGORY	ISSUE	OUTCOME	ACTIONS TO ACHIEVE THE OUTCOME(S)
ENVIRONMENTAL PROTECTION			
Water quantity	Large volumes of water may be used for multistage hydraulic fracturing in horizontal wells.	Maintain a sustainable level of nonsaline water use.	• Use a public-interest test process to develop, consult on, and review industry-led, play-focused water management plans for approval and implementation. • Minimize nonsaline water use during the exploration and piloting phase. Where feasible alternatives exist, eliminate nonsaline water use during full development. • Use saline water where supplies are available and adequately mitigate risks of use. • Support research into low-water fracturing technology and regulatory support for innovation and field testing. • Understand water needs for a specific play and coordinate between all operators. Only use volumes that are sustainable. • Understand water inventory (i.e., quantity available) for surface water and groundwater. • Measure and report volumes of nonsaline surface water and groundwater, saline groundwater, recycled water, and wastewater diverted for well completions. • Maximize alternatives to nonsaline water. • Maximize recycling of flowback water.
Water quality	Poor wellbore construction practices, inappropriate well completion techniques, or poor waste handling practices may affect surface water and nonsaline groundwater quality.	Maintain quality of surface water or nonsaline groundwater	• Ensure that nonsaline aquifers are not contaminated from vertical or crossflow communication or exposure to contaminants within fluids such as those within hydraulic fracture fluids, produced fluids, or flowback or reservoir fluids. • Ensure that contaminants from fluids, such as fracturing fluids, produced fluids, or flowback or reservoir fluids, are not released into the environment. • Use low-risk hydraulic fracturing fluids and reduce toxicity of fracture fluids. • Ensure that drilling and completion standards effectively protect water. • Ensure effective reporting of hydraulic fracturing fluid components and related volumes.

APPENDIX A: ACTIONS TO ACHIEVE REGULATORY OUTCOMES (CONTINUED)

ERCB MANDATE/ CATEGORY	ISSUE	OUTCOME	ACTIONS TO ACHIEVE THE OUTCOME(S)
ENVIRONMENTAL PROTECTION			
Waste management	Significant volumes of waste fluids will be generated from flowback of hydraulic fracturing fluids during well cleanup. These waste fluids must be properly stored and eventually disposed of.	Conserve resources, minimize waste, prevent pollution, and protect the environment and the public.	• Develop waste management facilities within the play area that are suitable for the rate and scale of development and to minimize the distance waste needs to be transported. • Maximize recycling. • Reduce the toxicity of injected material. • Engineer processes to minimize disposal needs.
Air quality	Increased air emissions from flaring during testing and cleanup, compressors, equipment, and vehicle traffic as a result of large number of wells. Associated gas production in an oil play would need to be flared if gas conservation infrastructure is not in place when oil production commences. Vapours from oil storage tanks may need special attention if not tied in to gas conservation infrastructure.	Ensure that the public and environment are not measurably affected by adverse air quality.	• Set play-focused flaring/incineration/venting requirements focused on reducing emissions. • Encourage early well connections to minimize flaring and venting needs. • Ensure that play-focused requirements are compatible with regional airshed plans. • Use best practices and the best available technology to reduce emissions from equipment and trucks. • Ensure that gas conservation infrastructure is considered an integral component of the play development plan.
RESOURCE CONSERVATION			
Conservation	Extent of economic recoverable reserves is unclear even though technology is quickly evolving. Opportunities for enhanced recovery are not well understood.	Maximize economic recovery of reservoir fluids and conservation of gas.	• Collect and analyze enough information about reservoir properties, conditions, and fluids to properly understand the reservoir system. • Establish reservoir development and primary depletion practices that follow sound engineering practices to achieve optimum primary depletion and ensure that the potential for secondary recovery is not jeopardized. • Ensure that gas conservation infrastructure is considered an integral component in the play development plan.

APPENDIX A: ACTIONS TO ACHIEVE REGULATORY OUTCOMES (CONTINUED)

ERCB MANDATE/ CATEGORY	ISSUE	OUTCOME	ACTIONS TO ACHIEVE THE OUTCOME(S)
RESOURCE CONSERVATION			
Equity	Deposits are continuous instead of in traditional hydrocarbon pools. In most cases, mineral rights will be held by multiple owners.	Ensure equal opportunity for all resource owners to receive an equitable share of production.	• Equity issues are considered to be low regulatory risk for unconventional resources. Development planning between operators should facilitate resolution of issues that do arise.
ORDERLY DEVELOPMENT			
Surface impacts	Additional surface footprint to the landscape from increased and often intense activity. Nuisances from this kind of activity, such as an increase in high volumes of vehicle traffic, noise, and dust.	Minimize regional effects of oil and gas development.	• Collaborate early on at the play level to anticipate infrastructure needs, examine low-impact options, and implement plans that balance environmental, social, and economic needs. • Collaborate on use and siting of new and existing infrastructure to minimize proliferation and heavy truck traffic. • Maximize use of existing infrastructure such as roads, well sites, and pipeline corridors. • Collaborate with other industries on roads and use of already disturbed sites. • Collaborate on operational matters to reduce risk (e.g., traffic accidents, road-use plans, offset well communication). • Support use of pads as the new standard and address any regulatory issues that may constrain their use. • Be proactive and consult with landowners, counties, and municipalities to identify opportunities to reduce effects of development. • Provide stakeholders with timely and useful quality information on unconventional resource development. • Ensure regionally focused consultation so that stakeholders understand the full scope of development and have clear and fair opportunities to provide input and be familiar with development. • Be proactive in increasing local authorities' awareness of any potential activity and effects that may result from development. • Adopt best practices and use the best available technology to mitigate effects of noise, lighting, and dust. • Address end-of-life infrastructure liability effectively without any cost to the public.

APPENDIX A: ACTIONS TO ACHIEVE REGULATORY OUTCOMES (CONTINUED)

ERCB MANDATE/ CATEGORY	ISSUE	OUTCOME	ACTIONS TO ACHIEVE THE OUTCOME(S)
PUBLIC SAFETY			
H_2S and other operational issues	Up-hole drilling or hydraulic fracturing could encounter sour zones even though new resource plays are expected to be sweet and, therefore, low risk.	Ensure that oil and gas activities do not compromise public safety	• Put effective emergency response plans in place where necessary to deal with any potential to encounters with sour gas. • Test the emergency response plan to ensure that sufficient capacity exists to deploy it swiftly and efficiently. • Include appropriate setbacks from the development that are protective of public.
INFORMATION AND ADVICE			
Data collection and analysis	Alberta's unconventional resource potential is vast and covers large areas of Alberta. Knowledge is necessary to ensure proper management and decision-making. An expanded and coordinated approach to gathering a solid base of information is required to understand and address regional or play-scale issues, given the scale and scope of surface and subsurface issues.	Understand and disseminate information on the extent of resources in the play, production capacity, reserves volumes, and other geological and reservoir characteristics.	• Ensure that data requirements are sufficiently met for resource/reserves assessments, effective reservoir understanding and management, and to meet conservation outcomes. • Data requirements are sufficient to address surface outcomes. • Require data systems that support effective analysis, management reporting, and timely regulatory response. • Have easy-to-access information on unconventional resources and its development publicly available to support decision making and outcome assurance.

APPENDIX B: DRAFT GUIDANCE ON REQUIRED ELEMENTS OF PLAY DEVELOPMENT PLANS

This appendix contains draft guidance on what is currently being considered as the content of play development plans to address water management, surface infrastructure, subsurface reservoir management, stakeholder engagement, and life-cycle wellbore integrity. Each issue, their desired outcomes, and potential requirements to achieve those outcomes are described in detail below.

1// Water Management

The ERCB and Alberta Environment and Sustainable Resource Development (ESRD) have jointly reviewed the water quantity and quality aspects of unconventional oil and gas development and developed the following outline for water management requirements related to play development plans.

Issues

A range of hydraulic fracturing technologies are in use in Alberta, and a number of variables affect the choice of fluid used. In some situations, hydraulic fracturing systems that either don't use water or use water in low volumes may be best suited to a particular unconventional resource play. In other cases, water volumes can be extensive and require significant associated infrastructure for transportation, storage, reuse, and disposal.

Regional water availability and competition for available supplies by existing and new water users varies considerably across Alberta. Accordingly, regional water supply risk will vary by region and watershed, and management plans must take this into account. Knowledge and understanding of groundwater inventories and public sensitivity to water use must also be considered. There are good opportunities for a play-focused group of operators to plan and collaborate to reduce water use and mitigate any effects.

Water Management Outcomes

- Maintain sustainable levels of nonsaline water use for the play.
- Maintain quality of surface water and nonsaline groundwater.

Key Directions or Actions

- Play-focused, integrated planning that includes water management plans. These plans will show that an escalating scale of development and increased water use will be matched with escalating regulatory requirements and oversight for more complex water management options and cumulative impact considerations.
- Conserve and minimize surface water and nonsaline groundwater use by identifying and assessing alternative water sources and recycling options, ensuring full-cycle risk implications of options are fully understood.
- Increase information on water inventory, demand, and operating performance to support decision making.
- Increase public awareness of and engagement on water outcome assurance.

Water Management Requirements

Effective water management will be required to achieve the outcomes in those plays that require water for hydraulic fracturing purposes. Operators must provide details on how they intend to manage water use through the various stages of development: exploration, pilot scale, and full commercial.

Operators within a declared play will be required to address the following in the play development plan:

- water source options and assessments of applicability to each play
- what is known on water inventories, existing water uses, and ecosystem water needs, including steps needed to improve knowledge in these areas
- data gaps, corresponding studies necessary to fill gaps, and plans to address data gaps, including opportunities to initiate and fund collaborative and timely scientific and technical studies
- management systems to effectively manage water access, transport, storage, use, and disposal
- opportunities to reduce water use, emphasizing a reduction of nonsaline water requirements
- opportunities to recycle and reuse flow-back or other produced water, including economic and/or technology constraints if present
- monitoring and reporting of groundwater and surface water, including a baseline assessment and ongoing monitoring and reporting of changes in quantity and quality, to ensure that outcomes are achieved
- a description of the hydraulic fracturing fluids typically used
- a description of how the water management plans for the play integrate with the plans of the Watershed Planning and Advisory Councils (WPAC) and the existing ESRD Water Management and Regional plans
- source and volumes of water for water-based hydraulic fracture fluids at each stage of development (exploratory, pilot, full commercial)
- an annual report of all water use, expected changes in water volumes, incidents, landowner issues, etc., for the play

The following sets out actions to be taken at each stage of development for the above water information:

- Exploration stage: Initiate a preliminary scan for potential water issues. Identify suitable/available water sources and water needs. Identify potential problems in long-term water availability at the piloting and development stages.
- Piloting stage: Collaborate on gathering information and identifying gaps in baseline information. Further investigate water-related issues and incorporate the results into criteria for pilot studies. Operators in the play must collaborate on play-scale reviews of groundwater, surface water, off-stream storage potential, and other potential sources/alternatives as well as water treatment, transport, and disposal opportunities.
- Development stage: Conclude groundwater and surface water studies and incorporate findings into long-term planning.

The ERCB will also collaborate with ESRD to

- establish a formal water measurement and reporting system for the use of all surface water, nonsaline groundwater, saline groundwater, wastewater, and recycled water;
- track and publicly report on all water used;
- require public disclosure of the chemicals within hydraulic fracture fluids;
- review and consider replacement options for and/or banning of certain high-risk substances from fracture fluids;
- review ESRD's groundwater aquifer testing standards and licensing guidelines to enable efficient and effective technical evaluation of groundwater supply on a play and/or aquifer basis as an extension or variation of existing well-by-well testing requirements for nonsaline groundwater use;

- conduct performance reviews to address need for water management changes and/or operational improvements based on evolving technology, changing economics, or changed water availability or overall risk (these reviews will also ensure that regulatory outcomes are being achieved); and
- continue groundwater (nonsaline and saline) mapping/inventory studies.

The ERCB and ESRD recognize that significant opportunities exist to improve how the existing water allocation and authorization processes support the outcomes of play-focused regulations. Some of these options have been highlighted in Appendix A. For more information on water allocation principles, see the *Water Conservation and Allocation Policy and Guideline for Oilfield Injection* (2006) on the www.waterforlife.alberta.ca website as well as the ESRD website www.environment.alberta.ca.

2// Surface Infrastructure

Increased activity from unconventional resource development mixed with existing conventional oil and gas activity, forestry activities, agriculture, and recreational use will result in competing interests for land use. Currently, there are limited requirements or incentives to limit proliferation of oil and gas infrastructure.

Surface Infrastructure Outcome

Play development that is coordinated, well planned, and controlled to minimize the regional effects of oil and gas development.

Surface Infrastructure Requirements

At the exploratory and piloting stages, limited knowledge is available to plan for full-scale development. However, once piloting proves successful, plans for full-scale development should be in place. Excellent collaboration and cooperation by all operators in the play is expected so that a single play development plan is submitted for the play.

Operators within a declared play should consider and address the following in the play development plan:

- opportunities or attempts to form an operators' group as a forum for cooperation, collaboration, and information sharing and to provide landowners and residents with a one-window contact
- approximate number of well pad locations required
- location of common corridors for pipelines and other infrastructure
- need for and location of processing facilities
- opportunities to minimize truck traffic
- barriers or issues, including those that are regulatory, that inhibit effective collaboration or use of common facilities
- how use of existing infrastructure (e.g., roads, pipelines, and processing facilities) will be maximized where possible
- opportunities to coordinate with disposition holders that are not in the oil and gas industry on sharing of roads and already disturbed surface sites
- efforts to work with counties and municipalities on planning infrastructure and road-use agreements
- opportunities to share or co-locate facilities in a way that reduces incremental disturbances and constraints on surface land uses
- Government of Alberta land-use planning objectives
- opportunities to work with landowners and synergy groups to identify suitable locations and orientation for well leases, production facilities, pipelines, and access roads

- location of new facilities so that disturbance of good-quality soils, surface water bodies, and riparian areas is avoided or minimized
- plans for the removal of oil and gas infrastructure when it is no longer required
- use of best available technology for minimizing nuisances such as light and noise
- opportunities to reduce flaring for well cleanup and early tie-in of natural gas to eliminate or reduce flaring
- opportunities to minimize overall air emissions
- how to identify land-use issues and then use the information in the earliest stage of project planning to locate and design facilities in a way that reduces and mitigates impacts on the area
- how to inform and educate area stakeholders on development projects in their community
- location of existing or proposed waste disposal facilities sited to reduce trucking distances

3// Subsurface Reservoir Management

Recovering Alberta's large unconventional resources will be technologically and economically challenging. Standard reservoir development practices, in particular well spacing and completion, will not achieve reasonable recovery levels. Recovery performance will be heavily dependent on the success of applied stimulation techniques, which can, in some cases, be related to how well the local rock stress regime and the effect of wellbore geometry is understood. Phase behavior of reservoir fluids in some unconventional plays may be complex, and production rates and pressure drawdown near the wellbore could affect overall hydrocarbon recovery. Enhanced recovery potential in unconventional resource plays is not well understood but could be affected by wellbore spacing, geometry, and stimulation techniques. Traditional data collection and reservoir engineering analysis that is valuable for conventional oil and gas pool management may not be valid for unconventional resources and new methods may be needed.

Subsurface Reservoir Management Outcomes

- Optimize economic recovery of reservoir fluids and maximize gas conservation.
- The extent of the play resource, productive capacity, reserves volumes, recovery factors, and geological and reservoir characteristics are understood and available for decision making.
- Each resource owner has an equal opportunity to receive its equitable share of production.

Subsurface Reservoir Management Requirements

Early development of a new resource play will focus on drilling design and completion techniques that optimize production and economics.

Operators within a declared play should consider and address the following in the play development plan:

- how contiguous mineral rights ownership will be optimized through use of holdings or unitization to maximize the productive land base, optimize well spacing and production, and minimize the area lost to spacing boundary setbacks
- indicate the optimum horizontal well length, orientation, spacing, construction, and completion techniques that will optimize ultimate economic recovery and maintain equity between different owners
- opportunities to share data and knowledge to benefit the overall development of the play
- effects of early production rates and pressure drawdown on the flow of reservoir fluids and hydrocarbon recovery

- conservation of associated gas production with commencement of oil production or as soon as possible thereafter
- the potential for enhanced recovery and primary production operations to jeopardize or improve opportunities for future enhanced recovery
- provisions for gathering data of sufficient type and quantity to fully understand geological characteristics, understand reservoir performance, optimize hydrocarbon recovery, and provide for in-place resource and recoverable reserves assessments
- assessment of opportunities for operators to collaborate on development and production strategies that would increase operational efficiency, particularly where enhanced recovery may be feasible

In addition, the ERCB will

- work with operators to assess data needs at each stage of development,
- improve electronic access to data,
- require improved compliance with data submission requirements,
- minimize data submission requirements where sufficient data exists or the data requirements are no longer considered appropriate,
- work with industry to reduce need for data requirement waivers on multiwell pads by prescribing pad-based or project-based requirements,
- ensure that any data required is necessary to meet regulatory outcomes,
- reduce data submission requirements during full commercial development when the geology and reservoir is sufficiently understood, and
- scale up resource approvals, such as spacing requirements and commingling approvals, to a play level.

4// Stakeholder Engagement

Play developments generally operate for several years, which is why it is important that companies build relationships that can endure the lifespan of a project within communities. Increasing awareness of the development and opportunities to provide constructive input into the process will reduce concerns and open up more opportunities for effective, two-way communication between industry and stakeholders.

Stakeholder Engagement Outcomes

- Stakeholders understand the potential scope of development as a result of early disclosure of development plans.
- Stakeholders have timely, clear, and fair opportunities for engagement.
- Industry has sound processes that ensure stakeholders are effectively engaged through meaningful interaction and two-way communication.
- Engagement efforts demonstrate an understanding of local community and stakeholder concerns and how to best address those concerns.
- Communication with stakeholders goes beyond traditional notification procedures to building productive relationships.
- Stakeholders have opportunities to provide input and express concerns about how development may affect their community.

Stakeholder Engagement Requirements

Operators in a play must develop a comprehensive stakeholder engagement plan that addresses how they will involve the public, landowners, and local authorities at each stage of the play development.

Operators within a declared play should consider and/or address the following in the play development plan:

- key stakeholders, specific concerns, and preferred methods of communication
- different options to engage, understand, receive input, and respond to the needs of various stakeholders
- proactive and timely disclosure of development plans as they evolve
- open dialogue about real and perceived impacts of development and opportunities to mitigate them
- method of evaluating engagement activities

5// Life-Cycle Wellbore Integrity

Hydraulic fracturing has expanded in use to many different reservoir rock applications with a range of types and sizes of fracture treatment. This evolution has raised the potential risk of wellbore failure both in the well being hydraulically fractured and surrounding wells. Consideration of these advanced drilling and completion technologies for the development of unconventional resources must be undertaken with the goal of ensuring that wellbore integrity is maintained. Individual resource play characteristics as well as area specific drilling and completion wellbore challenges are factors to be considered when designing appropriate wellbore construction programs for a play.

Life-Cycle Wellbore Integrity Outcomes

- Maintain quality of surface water and nonsaline groundwater.
- Prevent unintended fluid cross-flow between geologic strata.
- Ensure that wellbore fluids are contained within the wellbore and any adjacent wellbores.

Life-Cycle Wellbore Integrity Requirements

Operators will be encouraged to develop life-cycle wellbore management systems applicable to the play being developed. This should consider not only the integrity of wells being drilled but potential impacts to any adjacent wells, including abandoned wells, and steps should be taken to minimize risks. A key objective of the management system is to ensure that the risk of loss of wellbore integrity is a low as practicable. The processes and measures to achieve this level of risk must be detailed within the management plan. Factors that could affect wellbore integrity, such as reservoir characteristics and drilling and completion technologies, must be considered. The wellbore integrity plan should include

- fit-for-purpose well design and operation management plan for wells being drilled within the play that accounts for wellbore integrity risks during drilling, completion, stimulation, production, injection, and abandonment;
- assessments of 3D hydraulic fracture propagation extent and how it is determined;
- risk assessments and risk mitigation strategy for any adjacent wells that could potentially be affected by hydraulic fracturing operations;
- the determination of the performance measures that will be used to confirm wellbore integrity is being achieved (this could include a determination of the need for wellbore integrity monitoring throughout the productive life of the well to abandonment);
- contingency plans that are developed and ready to implement in response to a loss of integrity scenario; and
- assurance that the capability exists to execute on all operation management plans as designed.

APPENDIX C: GLOSSARY

COMMERCIAL DEVELOPMENT STAGE: The stage of development at which a viable commercial project has been confirmed, leading to expanded drilling and production.

DECLARED PLAY: A play that the ERCB has formally recognized as a regulated entity. Once a play is declared, a Board Order will be issued, and operators will be required to abide by the requirements for that play.

EXPLORATION STAGE: The initial drilling and testing of the resource to gather information on which potential further development can be based.

PAD APPROVAL: A new ERCB approval type that allows multiple wells and related infrastructure to be drilled from a single surface site under one approval.

PERFORMANCE-BASED REGULATION: Performance-based regulations specify the ends—the regulatory outcome or level of performance—that must be achieved but do not specify how to achieve them. They can be tightly or loosely defined and require the regulator to identify and assess risk while industry develops the means to mitigate that risk. By focusing on the regulatory outcomes rather than the precise hazards to be controlled or the means to control them, industry has the freedom to determine the best approach for achieving the objective or performance goal.

PILOTING STAGE: The stage of development at which there is further testing to confirm the viability of a resource, establish suitable completion technology, and refine economics. This stage occurs between the exploration and commercial stages of development.

PLAY: Known or estimated oil or gas accumulations that share similar geologic, geographic, and temporal properties, such as the source rock, migration pathways, timing, trapping mechanism, and hydrocarbon type.

PLAY DEVELOPMENT PLANS: Methods and procedures that show how the play-specified regulatory outcomes and regulatory requirements will be achieved. Plans would include sufficient details to allow an assessment of its effectiveness. All operators in the play would collaborate to develop the play development plan.

PLAY-FOCUSED REGULATION: A regulatory approach that addresses the regulatory risks of a defined play through proactive and collaborative play-focused planning by operators within the play to mitigate and minimize the effects of development.

PRESCRIPTIVE REGULATION: Prescriptive regulations are detailed rules that specify how to achieve an outcome or goal—from the actions that must be taken to who must comply and what is to be accomplished. Prescriptive regulations require the regulator to identify, assess, and develop the means to mitigate risk, such as specific behaviors, technology, procedures, or processes.

PROJECT PLAN: A project plan represents the portion of the play under common mineral ownership and is typically the development plan for one operator in the play. Similar to a play development plan, the level and detail of information depends on the phase of development and should be scoped accordingly.

REGULATORY OUTCOME: A result or objective that must be achieved. Regulatory outcomes can be achieved through a variety of regulatory tools.

RESOURCE PLAY: A type of play that involves continuous hydrocarbon systems where the source and reservoir rock are often the same. These plays tend to be geographically extensive.

RISK-BASED REGULATION: A regulatory approach that considers risk in all parts of regulatory design and implementation to ensure that regulatory responses are proportional to the corresponding risks.

STACKED PLAY: Two or more plays that are stacked vertically.

TIGHT: A word used to describe rock that has very low or lacks permeability.

UNCONVENTIONAL OIL AND GAS: Shale oil and gas, tight (low permeability) oil and gas, and coal bed methane (CBM) are all considered unconventional resources.

UNCONVENTIONAL RESOURCES: Any oil- or gas-bearing zone with low to very poor permeability that requires extensive stimulation to produce in commercial quantities. Compared to conventional resources, unconventional resource plays can be technologically challenging but geologically known.

FOR MORE INFORMATION, PLEASE VISIT: WWW.ERCB.CA
OR CALL OUR TOLL FREE NUMBER: 1-855-297-8311

Provide your feedback by:

E-mail urf_feedback@ercb.ca

Mail Regulating Unconventional Oil and Gas in Alberta
Energy Resources Conservation Board
Suite 1000, 250 – 5 Street SW
Calgary, Alberta T2P 0R4